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Practitioner's Docket No. 1956/135

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: James E. Dibb

Application No.: 09/879,554

Group No.: 2114

Filed: June 12, 2001

Examiner: Chu, Gabriel L.

For: Method and System for Repairing a Redundant Array of Disk Drives

Mail Stop Appeal Brief – Patents

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

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1. Transmitted herewith is the REPLY BRIEF in this application with respect to the Examiner's Answer mailed on April 20, 2006.

STATUS OF APPLICANT

2. This application is on behalf of other than a small entity.

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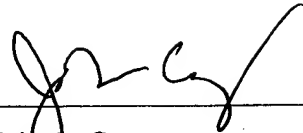
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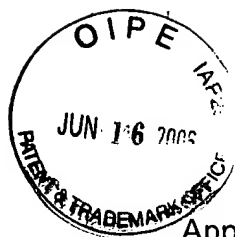
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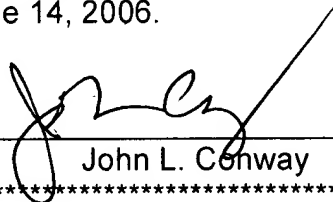
Attorney Docket: 1956/135

Group Art Unit: 2114

Examiner: Chu, Gabriel L.

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REPLY BRIEF

Applicant submits this reply brief for the subject application, in response to the examiner's answer ("EA") mailed on April 20, 2006.

In response to item (9) Grounds of Rejection and item (10) Examiner's Argument of Examiner's Answer ("EA"), Applicant submits the following remarks. Applicant's remarks are organized according to each of the two grounds of rejection.

1. Claims 1-15 stand rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement.

Applicant's application contains a good written description of the claimed subject matter, as it would be understood by one skilled in the art, as shown in full detail in Applicant's appeal brief on pages 9 to 16. According to the claims and the specification, even when the failed disk drive contains redundancy data, the mirrored subsystem can and is substituted for the failed drive. This can be accomplished as more specifically set forth in claims 3, by reconstructing each data block of the failed disk drive.

The main thrust of Examiner's argument, as presented in Examiner's Answer, item 10, is that Applicant's specification does not teach one skilled in the art to reconstruct all types of data on a failed disk drive. Examiner argues the application only teaches reconstruction of user (logical data) but not redundancy (e.g. parity) data. This reconstruction of data in embodiments of Applicant's invention is to a temporary drive that mirrors the failed disk drive. Thus, Examiner argues that claims drawn to this invention when redundancy data is present fail to meet the written description requirement under 35 U.S.C. §112, first paragraph and impermissibly insert new subject matter into the application. (EA 5).

To the contrary, one skilled in the art would conclude from Applicant's specification that all of the blocks on the failed drive, logical and redundancy, are to be reconstructed to the temporary drive. To conclude otherwise requires a strained and illogical construction of the specification, as urged by the Examiner (EA 8).

Thus, one skilled in the art would reasonably conclude Applicant had full possession of the claimed invention, satisfying the written description requirement. See, e.g., *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d at 1563, 19 USPQ2d at 1116; see also MPEP 2163.

Examiner's arguments are discussed below:

1. Examiner notes that the Background of Applicant's Specification discusses various types of RAID disk configurations (EA 6.) In fact, Applicant's background section states clearly by example the common understanding of those skilled in the art of disk storage arrays that "data" in a RAID disk drive array includes both logical and error correction data. For example:

"For example, one common RAID configuration, called RAID-5, includes several disk drives, where data is written in a "stripe" across the drives, consisting of corresponding data sectors on each drive, in which one of the data sectors stores parity data for the other data sectors in the stripe. These several disk drives form a redundancy group. If one of the drives suffers a failure rendering its portion of a stripe inaccessible, the lost data is reconstructed from the other drives via computation methods well known in the art, such as employing an exclusive-or operation among the data sectors on the other drives. "
(Applicant's specification, p. 1, lines 13-21; emphasis added)

As the emphasized words indicate, the term "data" includes each of the corresponding data sectors on each drive within the stripe. No distinction is made for the parity data in the stripe because the usual and customary meaning of the term "data" in a RAID-5 array implies no such distinction.

Applicant's Specification Background section gives as a second example, a RAID-3 array:

A second example of a redundancy group is a RAID-3 array. A RAID-3 array includes several disk drives, **where the data in a data block is written in a stripe across the drives, consisting of corresponding data sectors on each drive.** One of the drives stores parity data for the other sectors in the stripe and data is written in parallel to each drive. Data reconstruction if a drive fails is accomplished through a process similar to the process employed for a RAID-5 array. (Applicant's specification, p. 1, lines 22-29; emphasis added)

Again in accordance with customary terminology, "data in a data block" in the RAID-3 array consists of corresponding data sectors on each drive. One of the drives in the RAID-3 array stores parity data for the other drives. This paragraph further notes that "data" is written in parallel to each drive. Again, no distinction is made for the drive containing parity data because the usual and customary meaning of the term "data" in a RAID-3 array implies no such distinction.

2. Examiner notes that the Summary of Applicant's Specification discusses when repair of the failed drive is complete. (EA 6.) Examiner asserts that the Summary teaches that "the determination of repair is based on identical "data" between the temporary disk drive and replacement, not any such determination between either the temporary or replacement drives and the originally failed disk." In contrast to Examiner's assertion, the Summary instead teaches:

Each data block of the failed disk drive is reconstructed. Each reconstructed data block is written to the mirrored subsystem. At some point a replacement disk drive is inserted into the failed disk drive slot. Data is copied from the temporary disk drive to the replacement disk drive. The mirrored subsystem may be replaced by the replacement disk drive anytime after the data thereon matches the data on the temporary disk drive. **Repair of the failed disk drive is complete after both data reconstruction and insertion of the replacement disk drive are completed.** (Applicant's specification, p. 3, lines 7-14; emphasis added)

As Applicant's summary clearly teaches, repair of the array is complete after both (1) data reconstruction is complete and (2) insertion of the replacement drive is complete. Assuming *arguendo* Examiner's strained and illogical construction of the phrase "each data block of the failed drive is reconstructed" to mean only logical blocks are reconstructed, this repair condition would leave the array without the full redundancy the array had before the drive failed. This follows since the restored drive would be missing any redundancy data the drive contained before the failure. Thus, "each data block of the failed drive is reconstructed" must follow the usual, customary meaning of "each data block" to mean all of the data blocks that were on the failed drive, whether the data block contains logical data or redundancy data.

The Examiner notes in Examiner's Argument that the Summary of Applicant's Specification discusses when the mirrored subsystem may be eliminated in favor of the replacement disk drive (EA 7, first paragraph): "Data blocks' of the failed drive are reconstructed to the mirrored subsystem. When the replacement contains "the same data" as the temporary disk drive, the redundancy group may be restored to its initial configuration." This passage from the Summary of Applicant's Specification speaks to the second condition of array repair cited above in the Summary: (2) insertion of the replacement drive is complete. This passage notes the configuration of the redundancy group can be restored to its initial configuration of "n" disk drives, anytime after the replacement drive contains the same data as the temporary drive. However, repair is not complete until condition (1) is also satisfied – all data blocks are reconstructed to the replacement drive. Thus, the passage is fully consistent with reconstruction of all data blocks, logical and redundancy.

3. The Examiner notes in reference to Applicant's detailed description that:

"Applicant consistently refers only to the reconstruction of data blocks and makes no reference to the reconstruction of "error-correction blocks" or any other such terminology as would lead one of ordinary

skill in the art to the conclusion that redundancy data is restored.” (EA 8 ,second paragraph).

Applicant agrees that Applicant’s specification consistently refers to reconstruction of data blocks to mean reconstruction of all data blocks, both logical and redundancy data blocks. This usage, as shown in “2” and “3” above is fully consistent with the Background and Summary sections of Applicant’s Specification. This usage is consistent with the usual and customary meaning of “reconstructing each data block.” The Examiner reads into the specification the restriction that these data blocks are logical blocks only – a restriction that Applicant does not teach and that no showing has been made that one of ordinary skill in the art would make.

4. In response to Applicant’s argument in the appeal brief, the Examiner devotes several pages (EA 8 to EA 12) to noting that the detailed description does not specifically point out at every place where the description discusses reconstructing data blocks that “data block” means both logical blocks and redundancy (e.g. parity) blocks. Such qualification would be redundant to the meaning established in the Background and Summary of Applicant’s Specification. Such qualification is not needed by one of ordinary skill in the art applying the usual and customary meaning of “data block.” And such qualification is not needed to demonstrate to one skilled in the art that Applicant possessed the claimed invention. Applicant’s specification demonstrates clearly on page 7, lines 27 to 29 and fig. 2, that Applicant possessed the claimed invention:

“Reconstruction of the data that was formerly on drive A continues (130, 140, and 145), until completed. After both reconstruction of the data and replacement drive insertion complete, array repair is complete.”

One skilled in the art of disk arrays understands that array repair cannot possibly complete until drive A is restored to its former condition. When drive A contains logical data and redundancy data (or redundancy data only), reconstructing less

than all of the data blocks, both logical and redundancy (e.g. parity) cannot restore drive A to its former condition. Thus, the term “reconstruction of the data that was formerly on drive A” can only mean reconstructing all of the data blocks, both logical and redundancy since **that is the only way the array repair could be complete.**

Finally, the Examiner misunderstands the legal standard for fulfilling the written description requirement of 35 U.S.C. §112, first paragraph. Examiner writes “That Applicant must rely on what ‘one skilled in the art would reasonably conclude the inventor intended’ only further strengthens the fact that the subject matter is not present in Applicant’s specification.” In fact, Applicant satisfies the written description requirement of 35 U.S.C. §112, first paragraph when one skilled in the art would reasonably conclude Applicant had full possession of the claimed invention. See, e.g., *Vas-Cath, Inc. v. Mahurkar*, 935 F.2d at 1563, 19 USPQ2d at 1116; see also MPEP 2163. In this case, since one skilled in the art would reasonably conclude that “reconstructing each data block” means reconstructing both logical and redundancy blocks on the failed drive, the written description requirement is satisfied for claims 1-14 and claims 1-14 should be allowed.

2. Claims 16-19 stand rejected under 35 U.S.C. 102(e) as being anticipated by Kedem (6,154,853).

Claims 16 to 19 of Applicant's application are not anticipated by the U. S. patent to Kedem, no. 6,154,853 as shown in full detail in Applicant's appeal brief on pages 17 and 18.

In EA item 9 and EA item 10 for this issue, the Examiner reiterates Examiner's construction of the term "data block" as meaning only the logical data on the failed disk drive. For the reasons cited above for issue 1, the term "data block" must be construed to include all data, both logical and redundancy, on the failed disk drive. Under that proper construction, Kedem fails to reconstruct each data block of the failed drive, since Kedem does not reconstruct the redundancy data on the failed drive. Thus, Kedem does not teach a required limitation of claims 16 to 19, namely


 "...reconstructing each data block of the failed disk drive in the redundancy group; and writing each reconstructed data block to the mirrored subsystem."

Claims 16 to 19 of Applicant's application are therefore not anticipated by the U. S. patent to Kedem, no. 6,154,853 and should be allowed.

For the reasons set forth in Applicant's Appeal Brief and those expressed above, Applicant submits that all claims in the application are allowable over the art of record and early notice to that effect is respectfully solicited.

DATE: June 14, 2006

Respectfully submitted,



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